

Amendments to the Claims

This listing of claims will replace the originally filed claims in the application.

Listing of Claims:

Claims 1 – 14 (canceled).

Claim 15 (new): A method of laser beam welding comprising:

- a) employing a shielding gas mixture, said mixture comprising nitrogen and helium;
- b) adjusting the composition of said mixture in relation to the power or power density of said laser beam; and
- c) increasing the proportion of helium in said mixture when said laser power or density is increased.

Claim 16 (new): The method of claim 15, wherein said laser power is between about 0.5 kW and about 30 kW.

Claim 17 (new): The method of claim 16, wherein said laser power is between about 5 kW and about 20kW.

Claim 18 (new): The method of claim 15, wherein said mixture consists essentially of nitrogen and helium.

Claim 19 (new): The method of claim 15, further comprising mixing said nitrogen and said helium on site to produce said mixture.

Claim 20 (new): The method of claim 15, further comprising:

- a) producing said mixture with a gas mixer means; and
- b) controlling said mixing means in response to fluctuations in said laser power or power density.

Claim 21 (new): The method of claim 15, wherein said gas mixture further comprises a helium volume proportion of about 30% to about 80%.

Claim 22 (new): The method of claim 21, wherein said mixture consists essentially of:

- a) a helium volume proportion of about 30% to about 80%; and

- b) a nitrogen volume proportion of about 20% to about 70%.

Claim 23 (new): A method of laser beam welding comprising:

- a) employing a shielding gas mixture, said mixture further comprising nitrogen and helium; and
- b) adjusting the proportion of helium to nitrogen in said mixture based upon the power or power density of said laser beam in order to minimize plasma formation in said mixture during welding.

Claim 24 (new): A method of laser beam welding with a shielding gas mixture, said mixture comprising helium and nitrogen, wherein the volume proportion of said helium in said mixture further comprises at least one member selected from the group consisting of:

- a) about 1% to about 30% for a laser beam power of about 0.5 kW to about 4 kW;
- b) about 30% to about 50% for a laser beam power of about 4 kW to about 8 kW; and
- c) about 50% to about 70% for a laser beam power of about 8 kW to 12 kW.

Claim 25 (new): A method for laser beam welding with a shielding gas mixture, said mixture comprising helium and nitrogen, wherein the volume proportion of said helium in said mixture further comprises at least one member selected from the group consisting of:

- a) about 1% to about 30% for a laser beam power density of about 500 kW/cm² to about 2000 kW/cm²;
- b) about 30% to about 50% for a laser beam power density of 2000 kW/cm² to about 4000 kW/cm²; and
- c) about 50% to about 70% for a laser beam power density of 4000 kW/cm² to about 10000 kW/cm².

Claim 26 (new): The method of claim 15, further comprising:

- a) pre-mixing said helium and said nitrogen to the desired proportions; and
- b) supplying said helium and said nitrogen from a single gas source.

Claim 27 (new): An apparatus for laser beam welding with a shielding gas mixture of helium and nitrogen, comprising:

- a) at least one nitrogen source;
- b) at least one helium source;

- c) a gas mixing means for mixing said nitrogen from said nitrogen source with said helium from said helium source;
- d) a laser generating means capable of delivering a laser beam with a laser power of at least 0.5 kW; and
- e) a regulating means for said gas mixing means, wherein said regulating means regulates, in response to said laser power, at least one member selected from the group consisting of:
 - 1) helium; and
 - 2) nitrogen.

Claim 28 (new): A method of laser beam welding with a shielding gas mixture comprising helium and nitrogen, wherein the volume proportion of said helium in said mixture is a function of the power density such that:

$$28 \times \ln(\Phi_P) - 207 \leq \%He \leq 32.3 \times \ln(\Phi_P) - 207$$

wherein:

- a) $\ln(\Phi_P)$ represents the natural logarithm of said power density expressed in kW/cm²; and
- b) %He represents the volume percentage of helium in nitrogen of said gas mixture.

Claim 29 (new): The process of claim 28, wherein said volume proportion of said helium in said mixture is a function of said power density such that:

$$28.5 \times \ln(\Phi_P) - 207 \leq \%He \leq 31.5 \times \ln(\Phi_P) - 207.$$

Claim 30 (new): The process of claim 29, wherein said volume proportion of said helium in said mixture is a function of said power density such that:

$$29 \times \ln(\Phi_P) - 207 \leq \%He \leq 31 \times \ln(\Phi_P) - 207.$$